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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/626,982	07/27/2000	William Jon Schmidt	IBM / 09B	1040

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EXAMINER

GROSS, KENNETH A

ART UNIT PAPER NUMBER

2122

DATE MAILED: 02/03/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/626,982

Applicant(s)

SCHMIDT, WILLIAM JON

Examiner

Kenneth A Gross

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 12-19 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 12-19 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. ____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 3.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 12-19 are rejected under 35 U.S.C. 102(b) as being anticipated by “Compilers: Principles, Techniques, and Tools”, Alfred Aho, 1986.

In regard to Claim 12, Aho teaches a method of computing exit and entry properties of a set comprising: (1) copying into the set of entry properties of a basic block the set of exit properties of a previously selected basic block. In Figure 10.21(b) on page 612, it can be seen that the formula $\text{in}[S2] = \text{out}[S1]$ copies into the set of entry properties of basic block S2, the exit properties of the previous block S1; (2) modifying the set of entry properties of the currently selected basic block in accordance with the property modifications to generate exit properties for the currently selected basic block. Aho teaches in Figure 10.21(a) on page 612 the formula $\text{out}[S] = \text{gen}[S] \cup (\text{in}[S] - \text{kill}[S])$ which computes the exit properties of a basic block (out[S]) by modifying the entry properties of a basic block (in[S]).

In regard to Claim 13, Aho teaches depth-first ordering of basic blocks (Page 660, lines 29-37).

In regard to Claim 14, Aho teaches exit and entry properties which are essentially expressions that are available upon entry and exit of a basic block. In Figure 10.21 of page 612,

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the set S is a set of expressions that is available when entering and exiting a block, and is consistently updated when entering and exiting a block.

In regard to Claim 15, Aho teaches in Figure 10.21(a) on page 612 the formula $out[S] = gen[S] \cup (in[S] - kill[S])$ which computes the exit properties of a basic block ($out[S]$) by modifying the entry properties of a basic block ($in[S]$) using expressions generated by the basic block ($gen[S]$).

In regard to Claim 16, Aho teaches in Figure 10.21(a) on page 612 the formula $out[S] = gen[S] \cup (in[S] - kill[S])$ which computes the exit properties of a basic block ($out[S]$) by modifying the entry properties of a basic block ($in[S]$) using expressions killed by the basic block ($kill[S]$).

In regard to Claim 17, Aho teaches in Figure 10.21(a) on page 612 the formula $out[S] = gen[S] \cup (in[S] - kill[S])$ which computes the exit properties of a basic block ($out[S]$) by modifying the entry properties of a basic block ($in[S]$) using expressions killed by the basic block ($kill[S]$).

In regard to Claim 18, Aho teaches copying into the set of entry properties of a basic block the set of exit properties of a previously selected basic block. In Figure 10.21(b) on page 612, it can be seen that the formula $in[S2] = out[S1]$ copies into the set of entry properties of basic block $S2$, the exit properties of the previous block $S1$.

In regard to Claim 19, Aho teaches dead-code elimination (Page 531, lines 20-24, and Page 595), which is a method of removing expressions in code that is never used. If the expression is never used, it will not exist in the exit properties of any basic block, because it will

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not have been generated. Thus, according to dead-code elimination, the expression should be removed from the entry properties of the currently selected basic block.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

Bortnikov (U.S. Patent Number 5,950,009) teaches a method and apparatus for profile-based reordering of program portions in a computer program.

Bharadwaj (U.S. Patent Number 5,894,576) teaches a method of scheduling a set of instruction blocks for execution.

Sites (U.S. Patent Number 5,428,786) teaches a method of backward traversal of a group of predecessor blocks with examination conditions.

Subrahmanyam (U.S. Patent Number 6,192,513) teaches a method of searching successor blocks for the purposes of register availability checks.

Schmidt (U.S. Patent Number 6,117,185) teaches skip list data storage during compilation.

"Concurrent Maintenance of Skip Lists", William Pugh, 1989.

"Skip Lists: A Probabilistic Alternative to Balanced Trees", William Pugh, 1990.

"Abstract Description of Pointer Data Structures: An Approach for Improving the

"Analysis and Optimization of Imperative Programs", Joseph Hummel, 1993.

"Compiler and run-time support for semi-structured applications", Nikos Chisochoides, 1997.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kenneth A Gross whose telephone number is (703) 305-0542.

The examiner can normally be reached on Mon-Fri 7:30-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory A Morse can be reached on (703) 308-4789. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 746-7239 for regular communications and (703) 746-7240 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-3900.

KAG
January 29, 2003


GREGORY MORSE
SUPERVISORY PATENT EXAMINER
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